

## PALM AND TURN CHILD RESISTANT CLOSURE

### BACKGROUND

This invention relates to a closure for containers and, in particular, to a palm and turn child resistant safety closure for containers.

5           The hazards associated with medicine, pharmaceuticals, or other toxic materials are widely known. These materials are typically distributed in containers and can be found, in one form or another, in almost every household across America. When it comes to the containers housing these materials, safety closures have been utilized to prevent a child from opening the container and accessing its harmful contents.

10           Many of today's safety closures include a number of cooperating parts. These closures typically include at least two cap portions and a safety mechanism. The first cap portion engages a container while the second cap portion is used to rotate the first cap portion only after the safety mechanism has been engaged or disengaged (depending upon the type of safety mechanism employed). Typically, the elements of  
15 the safety mechanism are placed on both the first and second cap portions, requiring the user to operate the closure in a specific manner to remove the closure from the container.

Certain objectives underlie the design of a successful safety closure. They should be capable of being placed on conventional container necks using conventional  
20 capping machines. The closures should comprises as few parts as possible and the parts should be readily assembled with a minimum number of mechanical or manual

operations. The parts should be shaped and structured such that they can be fabricated at high speed in modern plastic injection molding machinery.

From a safety standpoint, a closure should require movement that is simple for an adult to open the container, but which requires simultaneous manipulations of at least two different mechanisms that are beyond the comprehension and manual manipulation of a small child.

Thus, there is a desire and need for a safety closure that is easy to manufacture and easily manipulated by an adult, yet child resistant.

### SUMMARY

10 The present invention provides a safety closure for a container. The closure includes an outer cap and an inner cap being rotatably received within the outer cap. The outer cap comprises a first top wall and a first cylindrical skirt depending from said first top wall, an inner surface of said first top wall having a plurality of lugs radially disposed thereon. The inner cap comprises a second top wall and a second cylindrical skirt depending from said second top wall, a plurality of recesses are radially disposed and formed at an intersection of said second top wall and second cylindrical skirt. The recesses are configured such that said lugs are received by at least some of said recesses when said outer cap is turned in a closure application direction causing said closure to be applied to a container. The recesses are further configured such that said lugs are not received by said recesses when said outer cap is turned in a closure opening

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direction unless a downward force is applied to said outer cap. When the downward force is applied to said outer cap and said outer cap is simultaneously turned in the closure opening direction said lugs are received by said recesses allowing said inner cap to be rotated and removed from the container.

5 In another aspect of the invention, a child resistant safety closure is provided. The closure contains an outer cap and an inner cap being rotatably received within the outer cap. The outer cap comprises a first top wall and a first cylindrical skirt depending from said first top wall, a plurality of lugs are radially disposed and formed at an intersection of said first top wall and said first cylindrical skirt. The inner cap  
10 comprising a second top wall and a second cylindrical skirt depending from said second top wall, a plurality of recesses are formed on an outer surface of said second top wall. The recesses are configured such that said lugs are received by at least some of said recesses when said outer cap is turned in a closure application direction. The recesses are further configured such that said lugs are not received by said recesses when said  
15 outer cap is turned in a closure opening direction unless a downward force is simultaneously applied to said outer cap.

In another aspect, a safety closure for a container having an outer cap and an inner cap being rotatably received within the outer cap is provided. The outer cap comprises a first top wall and a first cylindrical skirt depending from said first top wall, a  
20 plurality of lugs are radially disposed and formed at an intersection of said first top wall and said first cylindrical skirt. The inner cap comprises a second top wall and a second

cylindrical skirt depending from said second top wall, a plurality of recesses are radially disposed and formed at an intersection of said second top wall and said second cylindrical skirt, each of said recesses comprise a vertical wall and an inclined wall. The lugs act on said vertical walls when said outer cap is turned in a closure application

5 direction and said lugs slide up said inclined walls when said outer cap is turned in a closure opening direction and a downward force is not being applied to the outer cap.

It is an object of the invention to provide a child resistant safety closure for a container.

It is a further object of the invention to provide a safety closure with at least

10 one lug on an outer cap being received by a respective at least one recess on an inner cap when the outer cap is rotated in a closure application direction to allow the closure to be applied to a container.

It is a further object of the invention to provide a safety closure with recesses on an inner cap that are configured to prevent lugs of an outer cap from being received

15 within the recesses when the outer cap is rotated in a closure opening direction unless a downward force is applied to the outer cap.

Other objects, features and advantages of the present invention will become apparent from the following detailed description and drawings of preferred embodiments of the present invention.

### BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective exploded view of a palm and turn child resistant safety closure constructed in accordance with a preferred embodiment of the present invention.

5           FIG. 2 is a top perspective view of an exemplary outer cap of the closure illustrated in FIG. 1.

FIG. 3 is a top perspective view of an exemplary inner cap of the closure illustrated in FIG. 1.

10           FIG. 4 is a top view of an exemplary inner cap of the closure illustrated in FIG. 1.

FIG. 5 is a cross-sectional view taken along line V-V of FIG. 4.

FIG. 6 is a magnified view of a portion of the cross-sectional illustrated in FIG. 5.

### DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

15           With reference to FIGS. 1-6, a palm and turn child resistant safety closure 10 is shown according to a preferred embodiment of the present invention. The closure 10 includes an outer cap 20 and an inner cap 50. The inner cap 50 is sized to be rotatably received within the outer cap 20. It is desirable that the closure 10 be molded in a conventional molding tool and that the caps 20, 50 be formed of plastic.

The outer cap 20 includes a cylindrical top wall 22. A cylindrical skirt 30 depends from the top wall 22. An annular lip receptor 38 is formed at a lower portion 36 of the skirt 30. As will become apparent below, the receptor 36 will receive an annular lip 72 of the inner cap 50 to movably maintain the inner cap 50 within the  
5 outer cap 20.

An inner surface 26 of the top wall 22 contains a number of lugs 40 radially disposed thereon. The lugs 40 will be received by lug receptor recesses 60 formed in the inner cap 50. In a preferred embodiment, the lugs 40 are formed adjacent the intersection of the top wall 22 and the skirt 30. When the outer cap 20 is turned in a  
10 closure application direction, the lugs 40 will be received by some of the recesses 60, causing the lugs 40 to act on a vertical wall 62 of the recess 60 and causing the closure 10 to be applied to a container. In one exemplary embodiment, there are at least twelve lugs 40 and at least twelve recesses 60. In a preferred embodiment, there are at least twenty-four lugs 40 and twenty-four recesses 60. By using at least twelve lugs 40  
15 and twenty-four recesses 60, the user, in a worst case scenario, merely has to turn the outer cap 20 approximately an eighth of an inch or 15 degrees before the lugs 40 are received in the recesses 60, which makes it relatively easy for the user to apply the closure 10 to the container. It should be noted that any number of lugs 40 and recesses 60 may be used to practice the invention and the invention should not be limited to a  
20 particular number of lugs 40 and recesses 60.

When the outer cap 20 is turned in a closure opening direction, the lugs 40 will be slide up an inclined wall 64 of the recesses 60, preventing the lugs 40 from being received by any of the recesses 60. In order for the lugs 40 to be received by the recesses 60 when the outer cap 20 is rotated in the closure opening direction, a  
5 downward force must be simultaneously applied. The downward force causes the lugs 40 to engage the inclined walls 64 of the recesses, keeping the lugs 40 within the recesses 60 so that the lugs 40 can act on the inclined walls 64 and cause the closure 10 to be rotated off the container. Thus, the closure 10 requires simultaneous manipulations of at least two different mechanisms that are beyond the comprehension  
10 and manual manipulation of a small child.

In another exemplary embodiment of the closure 10, the top wall 22 of the outer cap 20 has a beveled edge 28 (FIG. 2) and the cylindrical skirt 30 depends from the beveled edge 28. In another exemplary embodiment, the skirt 30 contains a outer surface having a plurality of ridges 32 formed thereon. The ridges 32 help a user grip  
15 the outer cap 20 when applying or removing the closure 10. Moreover, it is also desirable for the outer surface 24 of the top wall 22 to contain indicia 42 instructing the user how to operate the closure. It should be noted that the beveled edge 28, ridges 32 and indicia 42 are not required to practice the invention.

Referring to FIGS. 1 and 3, the inner cap 50 includes a cylindrical top wall  
20 52. A cylindrical skirt 70 depends from the inner cap 50 top wall 52. The annular lip 72 is formed at a lower portion of the skirt 70. When the outer cap 20 is snapped onto

the inner cap 50, the lip 72 is received by the lip receptor 38 so that the inner cap 50 is movably maintained within the outer cap 20. Thus engaged, there will be both vertical movement and horizontal rotational movement between the inner and outer caps 50, 20. It should be noted that in another embodiment the inner cap 50 may be  
5 maintained within the outer cap 20 without the use of the lip 72.

An inner surface 76 of the skirt 70 is threaded 78 so that the inner cap 50 may be threadably engaged to a container having a threaded neck. A surface 54 of the inner cap 50 top wall 52 contains the plurality of recesses 60 formed therein. In one preferred embodiment, the recesses 60 are formed at the intersection of the inner cap  
10 50 top wall 52 and skirt 70. As noted above, the recesses comprises the vertical wall 62 and inclined wall 64. The recesses 60 also include a bottom wall 66 and a rear wall 68.

The recesses 60 are configured to receive the lugs 40 of the outer cap 20 when the outer cap 20 is rotated in the closure application direction. That is, when the outer cap 20 is rotated in the closure application direction, the lugs 40 lie within the  
15 walls 62, 64, 66, 68 of the recess 60. The lugs 40 also act on the vertical wall 62 to cause the inner cap 50 to rotate. The rotation of the inner cap 50 will be in the closure application direction, meaning that the threaded portion 78 of the inner cap 50 will engage the threaded portion of the container. By continuing to turn the outer cap 20 in the closure application direction, the inner cap 50, and thus the closure 10, will be  
20 properly applied to the container. An inner surface 56 of the top wall 52 seals off any contents of the container when the closure 10 is applied to it.



The recesses 60 are further configured to prevent the lugs 40 of the outer cap 20 from being received when the outer cap 20 is rotated in the closure opening direction unless a downward force is simultaneously applied to the outer cap 20 during the rotation. That is, when the outer cap 20 is rotated in the closure opening direction, without a downward force, the lugs 40 will slide up the inclined walls 64 of the recesses 60. Thus, when the outer cap 20 is rotated in the closure opening direction, the lugs 40 do not act on the inclined wall 64 in a manner that will cause the inner cap 50 to rotate. Since the inner cap 50 does not rotate, the threaded portion 78 of the inner cap 50 will not be disengaged from the threaded portion of the container and the closure 10 will not be removed from the container. Thus, as part of the child resistant mechanism of the present invention, an additional manipulation of the closure 10 is required to remove it from a container.

As noted above, the additional manipulation is the downward force that is simultaneously applied during the rotation of the outer cap 20 in the closure opening direction. When the outer cap 20 is rotated in the closure opening direction and the downward force is applied, the lugs 40 engage the inclined walls 64 of the recesses 60, which keeps the lugs 40 within the recesses 60. While the lugs 40 are within the recesses 60 and the closure is being rotated in the opening direction, the lugs 40 act on the inclined walls 64 causing the inner cap 50 to rotate. The rotation of the inner cap 50 will be in the closure opening direction, meaning that the threaded portion 78 of the inner cap 50 will disengage the threaded portion of the container. By continuing to

turn the outer cap 20 in the closure opening direction while simultaneously applying the downward force, the inner cap 50, and thus the closure 10, will be properly removed from the container.

Prior art closures have utilized domes and other mechanisms to separate their  
5 inner and outer caps. Often times these closure use flexible separators that slide down the dome when a force is applied to the outer cap. However, due to their shape, these domes have a high profile, leaving a larger gap between the inner and outer caps. The larger dome means that long separators are required to co-act with the domes, causing the prior art closures to utilize extra material, adding unnecessary expense to the final  
10 cost of the closure. By using recesses 60, the present invention has a low profile. Thus, the gap is reduced and less material is used to manufacture the closure 10 of the present invention.

In addition, by using recesses 60, the present invention can withstand long term top loading, which sometimes permanently deforms the flexible separators of the  
15 prior art closures. When the prior art closures are applied to containers and then subject to long term top loading, typically during shipping and vertical stacking, the flexible members can deform and lose their resiliency. Once the separators are deformed, the closure is no longer child resistant. Thus, the prior art closures may be ineffective even before getting into the hands of the consumer. As noted above, the  
20 closure 10 of the present invention uses recesses 60 and lugs 40, which are much

stronger than flexible members and will not deform when subject to long term top loading.

Moreover, the closure 10 of the present invention is substantially more durable than the prior art closures. The prior art closures typically rely on flexible  
5 separators for its child resilient feature. The flexible separators may become ineffective over time. When prior art closures age, the separators begin to lose their resiliency, which reduces the downward force required to open the closure and thus, reduces the overall effectiveness of the child safety feature of the prior art closure. As noted above, the closure 10 of the present invention uses recesses 60 and lugs 40, which are much  
10 stronger than flexible members. Moreover, the present invention does not rely on elements that must remain flexible or resilient over time, and thus, the closure 10 of the present invention is less likely to become ineffective as the closure 10 ages.

It should also be noted that the closure 10 is easy to manufacture. Referring to FIGS. 4 to 6, and in particular, the region denoted by reference numeral 82, it can  
15 be seen from the cross-section that the inner cap top wall 52 and skirt 70 have a substantially uniform thickness  $t$  in the regions adjacent to the recesses 60. This means that the inner cap 50 can be molded by a simple process without numerous molding steps. Region 82 denotes a portion of the inner cap 52 that would have been present if recesses 60 were not used by the present invention. The formation of the recesses 60 in  
20 this manner also improves the strength and durability of the inner cap 50, its child resistant mechanism and the closure 10. In addition, the design of the closure 10

provides for a straight pull out from the cavity of the tool used to mold the closure 10, which also makes the closure 10 easy to mold.

While the invention has been described in detail in connection with preferred embodiments known at the time, it should be readily understood that the invention is not limited to such disclosed embodiments. Rather, the invention can be modified to incorporate any number of variations, alterations, substitutions or equivalent arrangements not heretofore described, but which are commensurate with the spirit and scope of the invention. Accordingly, the invention is not to be seen as limited by the foregoing description, but is only limited by the spirited scope of the appended claims.

What is claimed as new and desired to be protected by Letters Patent of the United States is:

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1. A safety closure comprising:

an outer cap, comprising a first top wall and a first cylindrical skirt depending from said first top wall, an inner surface of said first top wall having a plurality of lugs radially disposed thereon; and

5 an inner cap being rotatably received by the outer cap, said inner cap comprising a second top wall and a second cylindrical skirt depending from said second top wall, a plurality of recesses are radially disposed and formed at an intersection of said second top wall and said second cylindrical skirt,

wherein said recesses are configured such that said lugs are received by at  
10 least some of said recesses when said outer cap is turned in a closure application direction causing said closure to be applied to a container, said recesses are further configured such that said lugs are not received by said recesses when said outer cap is turned in a closure opening direction unless a downward force is applied to said outer cap, and when the downward force is applied to said outer cap and said outer cap is  
15 simultaneously turned in the closure opening direction said lugs are received by said recesses allowing said inner cap to be rotated and removed from the container.

2. The closure of claim 1, wherein said recesses comprise a vertical wall and said lugs act on said vertical walls when said outer cap is turned in a closure application direction.